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## A new general purpose parallel database system

- Afshar, M.; Bates, J.; Bierman, G.; Moody, K.

Editor(s): Lai, F., Maggs, B., Hsu, D.F.

Comput. Lab., Cambridge Univ., UK

*This paper appears in: **Parallel Architectures, Algorithms, and Networks, (I-SPAN '97). Proceedings., Third International Symposium on***

On page(s): 2 - 8

18-20 Dec. 1997

1997

ISBN: 0-8186-8259-6

IEEE Catalog Number: 97TB100209

Number of Pages: xiii+503

References Cited: 13

INSPEC Accession Number: 5816459

### Abstract:

This paper is concerned with the transparent parallelisation of declarative data queries, based on theoretical principles. We have designed an entire database architecture suitable for use on any general-purpose parallel machine. This addresses the shortcomings in flexibility and scalability of commercial parallel machines. A substantial benefit is that the mathematical principles underlying our framework provably correct parallel evaluations and optimisations, using compile-time transformations. We address parallelism in a language-independent way through choice of monoids as a formulation for expressing and modelling queries. Queries expressed in our declarative language are transformed into applications of a higher-order function, the monoid homomorphism. The evaluation of this function is partitioned at run-time, giving a tree-like processor topology, the depth and breadth of which can be varied with a declarative execution plan. Leaf nodes within the tree operate on their own data partitions and forward results to the appropriate nodes. Due to the nature of our language, the functions that are necessary to combine results from independent parallel evaluations are generated automatically at compile-time from a monoid definition dictionary, additions to which can be made to extend the system's data types. We have built a complete prototype of our system which uses Swiss Radio Corporation's entire recorded music catalogue, on a general-purpose Ar1000, 128-cell parallel computer at the IFPC.

### Index Terms:

parallel machines; parallel database system; transparent parallelisation; declarative database queries; database architecture; parallel machine; compile-time transformations; tree-like processor topology; database queries

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## A parallel virtual machine for programs composed of ab: data types

*- Welch, L.R.*

Dept. of Comput. &amp; Inf. Sci., New Jersey Inst. of Technol., Newark, NJ, USA

*This paper appears in: **Computers, IEEE Transactions on***

On page(s): 1249 - 1261

Nov. 1994

Volume: 43 Issue: 11

ISSN: 0018-9340

References Cited: 48

CODEN: ITCOB4

INSPEC Accession Number: 4792169

**Abstract:**

An abstract data type mechanism is provided by many modern programming languages and is often employed during system development to promote modularity and encapsulation. This paper describes ARC, a parallel virtual machine designed for executing programs that use abstract data types (ADTs). The major contribution of ARC is that it supports Asynchronous Remote Procedure Call (ARPC), a model of parallel execution that is well suited for programs developed by layering ADTs. To support ARPC, ARC performs synchronization, automatic parameter restoration, and dynamic load balancing.

**Index Terms:**

software reusability; virtual machines; parallel programming; abstract data type structures; database management systems; multiprocessing programs; remote procedure calls; parallel virtual machine; abstract data types; programming language system development; modularity; reuse; ARC; ADTs; Asynchronous Remote Procedure Call; data synchronization; automatic parameter restoration; dynamic load balancing

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Nov 3, 1998

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TITLE: Database system with methods for parallel lock management

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TITLE: Minimal sufficient buffer space for data redistribution in a parallel database system

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DOCUMENT-IDENTIFIER: US 5687369 A

TITLE: Selecting buckets for redistributing data between nodes in a parallel database in the incremental mode

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May 27, 1997

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DOCUMENT-IDENTIFIER: US 5634125 A

TITLE: Selecting buckets for redistributing data between nodes in a parallel database in the quiescent mode

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Sep 6, 1988

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DOCUMENT-IDENTIFIER: US 4769772 A

TITLE: Automated query optimization method using both global and parallel local optimizations for materialization access planning for distributed databases

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	KWC	Draw Desc	Image
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*Wuytack, S.; da Silva, J.L.; Catthoor, F.; de Jong, G.; Ykman-Couvreux, C.*  
Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactio  
Volume: 18 Issue: 5 , May 1999  
Page(s): 533 -544

[\[Abstract\]](#) [\[HTML Full-text\]](#) [\[PDF Full-Text\]](#) **JNL****2 Reconfigurable software development**

*Clark, B.K.*  
Digital Avionics Systems Conference, 1991. Proceedings., IEEE/AIAA 10th , 1  
Page(s): 499 -503

[\[Abstract\]](#) [\[PDF Full-Text\]](#) **CNF****3 Engineering embedded knowledge-based software for a digital swi system**

*Bouteldja, M.*  
Software Engineering for Telecommunication Switching Systems, 1989. SET  
Seventh International Conference on , 1989  
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Computer Software and Applications Conference, 1988. COMPSAC 88. Proce  
Twelfth International , 1988  
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[\[Abstract\]](#) [\[PDF Full-Text\]](#) **CNF****5 Some practical considerations regarding an ADT-obsessed design**

*Naphtali, E.; Rich, M.*  
Software Engineering Journal , Volume: 3 Issue: 2 , March 1988  
Page(s): 57 -63



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Proceedings of the 22nd EUROMICRO Conference , 1995

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**1 OLAP query processing for partitioned data warehouses**

*Bellatreche, L.; Karlapalem, K.; Mohania, M.*

Database Applications in Non-Traditional Environments, 1999. (DANTE '99). Proceedings. 1999 International Symposium on , 2000

Page(s): 35 -42

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**2 The visual query language for an object-oriented knowledge-based**

*Ming Xu; Yong-Jun Wang; Yi-Jie Wang; Kang Zhang; Yanchun Zhang*

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**3 Effect of failures on optimal location management algorithms**

*Krishnamurthi, G.; Somani, A.K.*

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**4 Exploiting data lineage for parallel optimization in extensible DBMS**

*Shek, E.C.; Muntz, R.R.*

Data Engineering, 1999. Proceedings., 15th International Conference on , 1999  
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**5 Run-time detection in parallel and distributed systems: application safety-critical systems**

*Plale, B.; Schwan, K.*

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Proceedings , 1999

Page(s): 442 -450

[\[Abstract\]](#) [\[PDF Full-Text\]](#) **CNF****2 Proceedings. SCCC'99 XIX International Conference of the Chilean  
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of the Chilean , 1999[\[Abstract\]](#) [\[PDF Full-Text\]](#) **CNF****3 Interdatabase existence dependencies: a metaclass approach***Castellanos, M.; Kudrass, T.; Saltor, F.; Garcia-Solaco, M.*Parallel and Distributed Information Systems, 1994., Proceedings of the Thir  
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[\[Abstract\]](#) [\[PDF Full-Text\]](#) **JNL****5 An architecture for a scientific visualization system***Lucas, B.; Abram, G.D.; Collins, N.S.; Epstein, D.A.; Gresh, D.L.; McAuliffe,*

Visualization, 1992. Visualization '92, Proceedings., IEEE Conference on , 19

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